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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/554,415	10/24/2005	Thomas Sugar	09049-00004-US1	5350

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EXAMINER	
MATTER, KRISTEN CLARETTE	

ART UNIT	PAPER NUMBER
3771	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/554,415	SUGAR ET AL.	
	Examiner	Art Unit	
	KRISTEN C. MATTER	3771	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 January 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *10-18,21-24 and 37-49* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *10-18,21-24 and 37-49* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This Action is in response to the amendment filed 1/20/2011. No claims have been amended, cancelled or added. Thus, claims 10-18, 21-24, and 37-49 are currently pending in the instant application.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 11-13 and 38-40 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 11-13 and 38-40 relate to an embodiment that uses a shock absorber in place of a spring, the only description of this embodiment appearing to lie in Figures 11 and 12. However, there does not appear to be a description of how the mechanical device could be a shock absorber and be coupled "between the ends of the inner bladder" as required by claim 1 (i.e., in Figures 11 and 12, the shock absorber is clearly coupled beyond both ends of the inner bladder). Thus, the combination of the mechanical device being a shock absorber and being coupled "between the ends of the inner bladder" constitutes new matter.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 10, 14, 15, 17, 21-24, 37, 41, 42, and 44, 46-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ferrati (US 5,961,541) in view of Van der Linde (US 6,478,652), Wassam et al. (US 4,739,692, herein referred to as "Wassam") and Negishi et al. (US 5,158,005, herein referred to as "Negishi").

Regarding claims 10, 14, 15, 17, 21, 37, 41, 42, 44 and 46, Ferrati discloses a system of artificial muscles comprising a knee brace/first pivot member (17/22 with the associated rod seen in Figure 1), a foot support/second pivot member (on bottom of shoe and rod 10 seen in Figure 1) attached to the knee brace via a pivot joint (9), and a muscle actuator (16) coupled to both the knee and foot support at a location distal from the pivot joint (i.e., at heel and hip; see Figure 1).

Ferrati lacks the pair of muscle actuators being coupled to opposite sides on both the first and second pivot members (knee and foot supports). However, Van der Linde discloses a similar exoskeleton device with actuators (10) coupled on both sides of a brace member on the leg (column 2, lines 10-15). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided muscle actuators on both sides of the leg as taught by Van der Linde instead of only on one side as shown in Ferrati in order to provide more even assistance or to allow better control of the limbs via more actuators and antagonist forces.

Furthermore, there is nothing structurally in Ferrati preventing actuators from being placed on both sides of the limb and it appears as though Ferrati would perform equally well with such a modification.

Ferrati also discloses a pneumatic or hydraulic actuator (16) for moving the limb and thus lacks the specifically claimed actuator. However, McKibben-type muscle actuators are well known and commonly used in the art as demonstrated by Van der Linde (column 2, lines 50-55). In addition, Wassam discloses separately inflatable artificial muscle actuators comprising McKibben muscle actuators each having an inner bladder (14) connected at ends using a connector (13) and pressurized by a pneumatic source (17) so that the bladder expands in a radial direction (column 4, lines 25-35). The actuator includes a braided material (11) wrapped around and coupled to ends of the inner bladder (see Figure 1) such that when the bladder expands radially, the braided material contracts longitudinally (see column 4, lines 25-35). When the bladder is deflated, the device expands longitudinally (see claims 1-3). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the simple pneumatic actuator of Ferrati with the McKibben-type actuators of Wassam because it would have allowed more accurate and reliable control over the movement of the foot while walking and provided an additional antagonistic force to help quickly move the leg for walking. Such a modification would involve the mere substitution of a well known method (McKibben actuators) in a well known device (exoskeleton) to yield predictable results that do not patentably distinguish an invention over the prior art. Since there are two separate actuators/bladders in the modified device, it would have been obvious to configure them such that they are separately

pressurizeable (as is also suggested by Van der Linde's "antagonist" forces/actuators) to produce a desired motion such as walking.

Although Wassam discloses that the actuators expand longitudinally when the bladder is depressurized, Wassam does not provide details as to how that lengthening occurs and thus is silent as to the claimed mechanical device/helical springs. However, Negishi discloses, in a similar air-filled actuator, that it is possible to mount a spring at least partially disposed over the inner bladder (see Figure 3a), which is considered coupled between the ends of the inner bladder and is also considered to lie adjacent the inner bladder because it is next to the inner bladder. The spring serves to accomplish "quicker returning of the extensible member 20 to its original dimensions when then pressurizing fluid is exhausted" (see column 4, lines 40-45), similar to what seems to be described in Wassam. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided the modified Ferrati/Van der Linde/Wassam device with springs/mechanical devices coupled in parallel with and between the ends of the bladder as taught by Negishi in order to more quickly restore the actuator to its original length when the bladder is depressurized.

Because the spring has an outer diameter that encircles the bladder, the two are considered to lie in parallel (i.e., they share a longitudinal axis and overlap, same as in the instant invention). In addition, although not required by the instant claim language, examiner notes that how far the spring overlaps (i.e., just partially or over the entire bladder) is considered an obvious design choice to one of ordinary skill in the art. So long as the spring was able to restore the actuator to its original length, having more overlap would help to save space for example,

and would involve a mere change in dimension that is within the knowledge of one of ordinary skill in the art.

Obviously, in order for the spring to properly work and return the bladder to its original length it would have to be able to push against two mechanical components/connectors (see also Figure 1 of Van der Linde where a spring 11 is secured between two connectors, Figure 10 of Wassam where the bladder/braid is secured between two mechanical connectors, and Figure 3b of Negishi where the spring is attached to a mechanical component).

Regarding claims 22 and 47, the modified Ferrati reference lacks a telescoping structure. However, Negishi discloses, in a similar air-filled actuator, two telescoping tubular shell members (22) positioned over at least a portion of a braided material and bladder and a clamping device attached to each end of a spring (column 4, lines 45-55). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided Ferrati's modified device with a telescoping structure as taught by Negishi in order to hide and protect the inner working components of the actuator. Furthermore, there is nothing structurally that would prevent the addition of a telescoping structure to Ferrati and it appears as though the device would perform equally well with a telescoping structure as taught by Negishi.

Regarding claims 23, 24, 48, and 49, the modified Ferrati reference is silent as to which way the springs are clamped, but Wassam discloses lengthening of the device when depressurized. In addition, examiner notes that the spring of Negishi is clamped in a stretched position so that it is compressed when the telescoping members expand (see Figure 3a). Upon removal of the force created by the pneumatic source, the compressed spring exerts a force that more quickly returns the telescoping portions to their original position (column 4, lines 35-45).

Depending on the desired application and use of the device, whether the spring is clamped in a compressed or stretched position is considered an obvious design consideration to one of ordinary skill in the art because both positions would allow the bladder to return to its original length, just via different means (i.e., if the spring is clamped in a stretched position it will push the bladder back to its original length, and if the spring is clamped in a stretched position it will pull the bladder back to its original position). Furthermore, it appears as though the modified device would perform equally well with either type of spring clamping means/position.

Claims 11-13, 18, 38-40, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ferrati, Van der Linde, Wassam and Negishi, as applied to claims 10, 14, 15, 17, 21-24, 37, 41, 42, and 44, 46-49 above, and further in view of applicant's admitted prior art.

Regarding claims 11-13 and 38-40, the modified Ferrati reference lacks shock absorbers for the mechanical devices. However, shock absorbers are well known and commonly used for quick return of extensible members (see cited art and also applicant's specification paragraph 58 in which shock absorbers are discussed as being prior art devices). Furthermore, applicant has never disputed examiner's assertion that the claimed shock absorbers are a well known equivalent to the springs for returning the actuators to their original length and therefore use of the claimed shock absorbers is now considered admitted prior art. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have replaced the spring of the modified Ferrati device with a shock absorber in order to provide a well known and commonly used equivalent to a spring for quickly returning the extensible member to its original

length and to allow more accurate control over the speed of return than capable with a spring. Furthermore, there is nothing structurally that would prevent such a modification and it appears that the modified device of Ferrati would perform equally well with a shock absorber (or any other means capable of quickly returning the member to its original length). The specific type of shock absorber (i.e., locking compression gas spring-type) is considered an obvious design consideration to one of ordinary skill in the art depending on the specific application the actuator is being used for and the needed control with extension and compression of the device.

Regarding claims 18 and 45, the modified Ferrati reference is silent as to an adjustment clamp. However, Van der Linde discloses that springs can be made to have adjustable stiffness (column 2, lines 50-55) and adjustment clamps are well known and commonly used with springs to allow for adjustment of tension to individualize an actuator device. In addition, applicant has never disputed examiner's assertion that adjustment clamps are well known and therefore the claimed adjustment clamps are now considered to be admitted prior art. Therefore, it would have been obvious to one of ordinary skill in the art to add an adjustment clamp to the modified Ferrati device, (particularly if the spring was located adjacent or outside the bladder) in order to allow a user to set a desired tension on the spring to control the strength and speed of return to its original length. Such a modification would involve the mere use of a well known method (adjustment clamps/knobs) in a well known device (spring of a muscle actuator) to yield predictable results that do not patentably distinguish an invention over the prior art.

Claims 10, 14, 16, 17, 21, 37, 41, 43, 44, and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ferrati in view of Van der Linde, Wassam, and Chiel et al. (US 2003/0065250, herein referred to as "Chiel").

Regarding claims 10, 14, 16, 17, 21, 37, 41, 43, 44 and 46, Ferrati discloses a system of artificial muscles comprising a knee brace/first pivot member (17/22 with the associated rod seen in Figure 1), a foot support/second pivot member (on bottom of shoe and rod 10 seen in Figure 1) attached to the knee brace via a pivot joint (9), and a muscle actuator (16) coupled to both the knee and foot support at a location distal from the pivot joint (i.e., at heel and hip; see Figure 1).

Ferrati lacks the pair of muscle actuators being coupled to opposite sides on both the first and second pivot members (knee and foot supports). However, Van der Linde discloses a similar exoskeleton device with actuators (10) coupled on both sides of a brace member on the leg (column 2, lines 10-15). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided muscle actuators on both sides of the leg as taught by Van der Linde instead of only on one side as shown in Ferrati in order to provide more even assistance or to allow better control of the limbs via more actuators and antagonist forces. Furthermore, there is nothing structurally in Ferrati preventing actuators from being placed on both sides of the limb and it appears as though Ferrati would perform equally well with such a modification.

Ferrati also discloses a pneumatic or hydraulic actuator (16) for moving the limb and thus lacks the specifically claimed actuator. However, McKibben-type muscle actuators are well known and commonly used in the art as demonstrated by Van der Linde (column 2, lines 50-55). In addition, Wassam discloses separately inflatable artificial muscle actuators comprising

McKibben muscle actuators each having an inner bladder (14) connected at ends using a connector (13) and pressurized by a pneumatic source (17) so that the bladder expands in a radial direction (column 4, lines 25-35). The actuator includes a braided material (11) wrapped around and coupled to ends of the inner bladder (see Figure 1) such that when the bladder expands radially, the braided material contracts longitudinally (see column 4, lines 25-35). When the bladder is deflated, the device expands longitudinally (see claims 1-3). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the simple pneumatic actuator of Ferrati with the McKibben-type actuators of Wassam because it would have allowed more accurate and reliable control over the movement of the foot while walking and provided an additional antagonistic force to help quickly move the leg for walking. Such a modification would involve the mere substitution of a well known method (McKibben actuators) in a well known device (exoskeleton) to yield predictable results that do not patentably distinguish an invention over the prior art. Since there are two separate actuators/bladders in the modified device, it would have been obvious to configure them such that they are separately pressurizeable (as is also suggested by Van der Linde's "antagonist" forces/actuators) to produce a desired motion such as walking.

Although Wassam discloses that the actuators expand longitudinally when the bladder is depressurized, Wassam does not provide details as to how that lengthening occurs and thus is silent as to the claimed mechanical device/helical springs. However, Chiel discloses, in a similar air-filled actuator, a spring mounted inside the inner bladder (see Figure 2A), which is also considered to lie adjacent the inner bladder because it is next to the inner bladder, that serves to restore the bladder to its original length upon depressurization (see paragraph 38). Therefore, it

would have been obvious to one of ordinary skill in the art at the time the invention was made to have mounted a spring in the modified Ferrati device inside the inner bladder as taught by Chiel in order to provide the antagonist force to return the bladder to its original length and to minimize the chance of the spring getting tangled with/pinching a user. Furthermore, because all of the claimed locations of the spring (inside, outside, adjacent) would produce the same movement, it appears as though Ferrati would perform equally well with a spring being mounted inside the inner bladder.

Because the spring has an outer diameter that is completely within the bladder, the two are considered to lie in parallel (i.e., they share a longitudinal axis and overlap, same as in the instant invention). Obviously, in order for the spring to properly work and return the bladder to its original length it would have to be able to push against two mechanical components/connectors (see also Figure 1 of Van der Linde where a spring 11 is secured between two connectors, Figure 10 of Wassam where the bladder/braid is secured between two mechanical connectors, and Figure 2A of Chiel where the spring appears to be attached to a mechanical component).

Claims 11-13, 18, 38-40, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ferrati, Van der Linde, Wassam and Chiel, as applied to claims 10, 14, 16, 17, 21, 37, 41, 43, 44, and 46 above, and further in view of applicant's admitted prior art.

Regarding claims 11-13 and 38-40, the modified Ferrati reference lacks shock absorbers for the mechanical devices. However, shock absorbers are well known and commonly used for

quick return of extensible members (see cited art and also applicant's specification paragraph 58 in which shock absorbers are discussed as being prior art devices). Furthermore, applicant has never disputed examiner's assertion that the claimed shock absorbers are a well known equivalent to the springs for returning the actuators to their original length and therefore use of the claimed shock absorbers is now considered admitted prior art. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have replaced the spring of the modified Ferrati device with a shock absorber in order to provide a well known and commonly used equivalent to a spring for quickly returning the extensible member to its original length and to allow more accurate control over the speed of return than capable with a spring. Furthermore, there is nothing structurally that would prevent such a modification and it appears that the modified device of Ferrati would perform equally well with a shock absorber (or any other means capable of quickly returning the member to its original length). The specific type of shock absorber (i.e., locking compression gas spring-type) is considered an obvious design consideration to one of ordinary skill in the art depending on the specific application the actuator is being used for and the needed control with extension and compression of the device.

Regarding claims 18 and 45, the modified Ferrati reference is silent as to an adjustment clamp. However, Van der Linde discloses that springs can be made to have adjustable stiffness (column 2, lines 50-55) and adjustment clamps are well known and commonly used with springs to allow for adjustment of tension to individualize an actuator device. In addition, applicant has never disputed examiner's assertion that adjustment clamps are well known and therefore the claimed adjustment clamps are now considered to be admitted prior art. Therefore, it would have been obvious to one of ordinary skill in the art to add an adjustment clamp to the modified

Ferrati device, in order to allow a user to set a desired tension on the spring to control the strength and speed of return to its original length. Such a modification would involve the mere use of a well known method (adjustment clamps/knobs) in a well known device (spring of a muscle actuator) to yield predictable results that do not patentably distinguish an invention over the prior art.

Response to Arguments

Applicant's arguments with respect to claims 10-18, 21-24, and 37-49 have been considered but are moot in view of the new ground(s) of rejection.

Upon a more careful reading of Wassam, it appears as though Wassam discloses McKibben-type actuators that return to their original lengths via a mechanical property of a component of the actuator, without the need for an entirely separate actuator as discussed in the above rejection. Applicant argues that all of the prior art device require an external force to restore to their original dimensions, but in view of the reconsideration of Wassam and combination with Negishi and/or Chiel, such argument is not found convincing. Both Negishi and Chiel clearly teach an extensible/contractible bladder that uses no external structure for expansion/contraction of the bladder, the same way as in the instant invention. Since this appears to be a well known method hinted at by Wassam, examiner maintains that using the specific structure and location of mechanical devices taught by Negishi and/or Chiel in Wassam's McKibben actuator would have been obvious to one of ordinary skill in the art at the time the invention was made. Furthermore, the use of any well known actuator (including McKibben type

actuators as taught by Van der Linde and Wassam and Negishi) would have been obvious in the exoskeleton of Ferrati/Van der Linde for the reasons discussed above.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KRISTEN C. MATTER whose telephone number is (571)272-5270. The examiner can normally be reached on Monday - Friday 9-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Justine Yu can be reached on (571) 272-4835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kristen C. Matter/
Examiner, Art Unit 3771